COMPARISON OF CEREAL AND FORAGE CROPS AS LIVESTOCK FEEDS IN THE VARIOUS SOIL ZONES OF SASKATCHEWAN

by

M. R. Kilcher,
Research Station,
Swift Current, Sask.

Presented at the Soil Fertility Workshop
February 19, 1971.
Saskatoon, Sask.

Being the principal grain province in Canada, Saskatchewan has a long history of wintering livestock on the hay or straw, or both, from cereal crops. One needs only to compare the known cattle populations through the years with the estimated acres in forage crops to know that this livestock had to be getting most of its feed from sources other than tame forage crops. From studies and surveys conducted on 300 farms in the Dark Brown and Brown soil zones as recently as the early 1960's, it was shown how important the cereal crops were for feed (11). These studies showed that winter feed, other than straw, was comprised of cereal "green-feed" hay to the extent of 44%; native or wild hay, 32%; and tame forage hay, 24%. And it should be reiterated that these figures do not include the straw which was used. Likewise, a later study in the late 1960's showed that in southern Alberta cereal hay and straw made up over half of the winter roughage (4). From the foregoing it can be deduced that even through the last decade straw probably made up 30% of all the harvested feed, cereal hay probably another 30%, native hay slightly more than 20% and tame forages less than 20%.

These figures are presented as background material to today's discussion. This presentation will be an endeavor to appraise cereals versus tame forage with respect to quality of feed, yields, consistency of performance and comparative costs. Only limited reference will be made to quality in the light of the contents of the other presentations being made today. However, I think it is accurate to acknowledge that of the four criteria listed above the one which shows the largest variation is quality. Not only are there large inherent differences in the average nutritional level between ripe straw, green cereal hay and tame forage, but there can be even larger quality differences within these crops. The stage at harvesting time, the leaf:stem ratio, the amount of legume in a crop, the method of harvesting and preservation and the incidence and degree of weathering can, in all possible combinations, contribute substantially to the end quality of any one feed, be it hay, roughage or coarse roughage. At this point I think it is important in any discussion about livestock feed, and cattle in particular, to define the terminology being used. Feed, as used here, like the word fodder, is an all-inclusive term referring to the fibrous food that is usually fed to cattle, horses or sheep. Within this broad category we like to think in terms of the following classes: coarse roughage, then roughage, and finally hay. Coarse roughage is uncut unprocessed residue material like ripe straw from a cereal crop which has been harvested for grain. Roughage is unprocessed plant material of somewhat better quality which has a naturally higher intake consumption than that experienced with ripe straw. Feeds such as half ripe cereal straw or nearly mature forage plants

can be considered roughage. Hay (although still performing a roughage role in the digestive function of an animal) is the unprocessed plant material that has been harvested somewhere between the bud or boot stage to the early dough stage. It is green in color, its' intake is relatively high and its' digestibility usually exceeds 65%. Examples of feed which deserve to wear the connotation "hay" are grass or grass-legume forages which have been cut by at least the flower stage or good green oats harvested before the advanced dough stage. Any appreciable deterioration after cutting, but before preservation, could reduce this material from "hay" to "roughage" as defined here. Enough about quality.

About yield or quantity, we have compiled a goodly number of measurements in the past. Research Stations, Experimental Farms, universities and other testing agencies have recorded countless yield trials which present a valid comparison between cereals and forage crops. For the black and degraded soils the Indian Head, Melfort and Scott stations have compiled considerable yield data (6, 9, 13). Considering essentially non-fertilized forage stands, the Melfort station shows grass hay yields as falling in the range of 1 to 3 tons per acre depending on climatic variations and age of stand (9). Indian Head shows a somewhat lower range for grass hay on their better black soils (6). The records for yields of mixtures (i.e., grass and legume) on these same soils do not show a range much higher than that for grass alone, although the frequency of occurrence for yields at the top end of the range has been much greater. On the degraded blacks and grey soils the range for hay yields from grass-alfalfa mixtures has been lower and

narrower than on the better black soils. Thus, the records tend to show a yield range in the ¾ to 2 ton value.

How have these forage yields compared to those obtained from cereals? Whole plant wheat cereal hay yields at White Fox never exceeded one ton per acre (9). At Parkside and Archerwill the highest yields were ¾ and 1 ton, while at Melfort the higher wheat cereal hay yields barely exceeded one ton per acre. On the other hand, oats has had a much better record of performance. Both at Melfort and Indian Head the yields of oat hay on black soils do exceed 3 tons at times and most frequently provide 2 tons. Coarse roughage yields from grain fields are yet another story. After considering stubble height and leaf loss after threshing the per acre yields of cereal straw is most frequently in the ½ to ¾ ton range (2).

In the two Brown soil zones cereal roughage and cereal hay have, to the present, performed a more important role than they probably have in the black soils. Cereals for feed are more frequently grown on fallowed land on the brown soils than they are on the black soils. Hence, the consistency of cereal hay yield has been greater than the wild ¼ to 2 ton fluctuations experienced with tame perennial forage crops (12, 13 and 14). Over a 31-year period at Swift Current, oats on fallow gave an average annual yield of 1 2/3 tons of hay (8). In only 3 of 10 years has oat hay yielded less than one ton per acre while in 6 of 10 years grass-alfalfa yielded less than ¾ tons (14, 15). It is this kind of performance which has contributed greatly to the "forage bank" or "forage reserve" philosophy. One cannot deny the sensibility of this philosophy if consideration of average annual yields are taken into account. A 1 2/3 ton yield of oat hay on fallow is equivalent to .8

tons per cultivated acre. This is about equal to same average annual yields from grass-alfalfa stands. This similarity in average annual yields on cultivated acre basis for oats on fallow versus perennial tame forage mixtures has been reported repeatedly (7, 12, 14, 15). Notwithstanding the higher cost of producing oat hay on fallow it is a locked-in part of the feed program on the brown soils. It provides the insurance or back-up feed source in years of extreme drought and slim forage yields.

As on the black and degraded soils, the ripe straw coarse roughage is a pretty skeptical source of livestock feed. It is estimated that on the average the straw to grain ratio approaches 1.5:1 (1). A 20-bushel wheat crop represents 1200 pounds of grain and 1800 pounds of straw. Discount half this 1800 pounds as non-recoverable and we are looking at less than a half a ton of the poorest quality feed that can be gathered. And that straw costs next to nothing is but a fallacy. Just to get straw into the farmyard represents an investment of eight dollars per ton (15). In itself this means that straw going to livestock is only costing ½¢ per pound or about 5 to 6 cents per day per cow. This, however, is not inexpensive feed since supplementation with 6 pounds of grain and other supplements may easily add 12 to 15 cents per day. It is not the intention in this paper to analyse the comparative costs of different rations, but 10 to 12% protein hay instead of 3 to 4% straw might well be a less expensive contributor to the needed ration cost for wintering that cow (10).

What's in store for the future? Saskatchewan's cattle population has been a rather static one during the pastten years at about 2¼ million

head (5). Despite all the recent talk about how fast we are going to increase this population the livestock producers and advisers know that the increase cannot be greater than 5% annually. On the other hand, the recent impetus in increased forage crop seedings may quickly see a balance between provincial supply and demand for needed tame forage to winter our livestock. A modest extrapolation from 1969 figures would suggest that we could currently have 2 million acres in forage crops right now (3 & 5). As a result of last year's LIFT program and the very recent agricultural policy announcements, the increases in total production of forage hay within the next few seasons will most likely meet the equivalent requirement easily for even a growing cattle population.

You may know that the general rule of thumb in wintering cattle is that on the average it takes a ton of hay to winter the average cattle beast—considering weanling calves, yearlings and mature breeding stock. With 2¼ million cattle we may not be so awfully far off target right now[1]. Certainly within two years our only real problem will continue to be having the cattle where the forage is or vice versa. As for cereal crops, I think oats will continue to play the insurance role, particularly in the drier portions of the two brown soils, and most likely ripe straw will be relegated to its proper role of providing the needed litter and bedding in so far as the livestock industry is concerned.

---

[1] Sask. Crop Report No. 20, Nov. 1970. Economics and Statistics Branch, Sask. Dept. Agr. - quoting D.B.S. values as 1.6 million acres in tame hay. (1.6 mill. X 1.6 ton/ac for 1970 = 2.5 mill. tons).

REFERENCES

1. Anderson, D.T. et al. 1966. Soil erosion by wind. C.D.A. Pub. 1266.
2. Bowren, K.E. and W.N. MacNaughton. 1967. The effect of controlled cropping on degraded soil. C.D.A. Bulletin. 15 pg.
3. Canada Year Book. 1969. D.B.S. Queen's Printer. Ottawa.
4. Elgard, Knud. 1968. Cattle ranching in southern Alberta. Econ. Br. C.D.A. Pub. 68-3.
5. Sixth Annual Report of Director of Economics and Statistics. 1970. S.D.A. Regina.
6. Indian Head C.D.A. Research Reports - to present. (E. Buglass and others).
7. Kilcher, M.R. and D.H. Heinrichs. 1961. A grass-alfalfa mixture compared with cereal grains for fodder production under semiarid conditions. Can. J. Plant Sci. 41: 789-804.
8. Kilcher, M.R. and D.H. Heinrichs. 1968. Annual crops for forage in southwestern Saskatchewan. S.C. Mim. Bull. 15 pp.
9. Melfort C.D.A. Research Reports - to present, plus personal communication. (S.E. Beacom, K.E. Bowren, D.A. Cooke, J. Waddington and others).
10. National Academy of Sciences and National Research Council. 1963. No. 4. Nutrient requirements of beef cattle. (Revised edition). Pub. 1137. Washington.
11. Ragush, M. 1961 through 1964 Series. Changes in farm organization on (both low and medium productive soils in the Brown and Dark Brown Zones). 4 Econ. Branch C.D.A. Publications.

12. Saskatoon C.D.A. Research Reports - to present plus personal communication (W.L. Crowle, R.P. Knowles, L.G. Sonmer and others).

13. Scott C.D.A. Exp. Farm Reports - to present (W.L. Crowle, C.H. Keys, H. Ukrainetz and others).

14. Swift Current C.D.A. Research Reports - to present (C.H. Anderson, D.H. Heinrichs, M.R. Kilcher, T. Lawrence and others).

15. Weins, J.K. and M.R. Kilcher. 1971. Winter feed production on grain cattle farms in Saskatchewan. Can. Farm Econ. Vol. (In press).